Study of Impacts Caused by Exempting the Maine Turnpike and the New Hampshire Turnpike From Federal Truck Weight Limits

Executive Summary

June 2004

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We wish to recognize the contributions made by the Advisory Committee.

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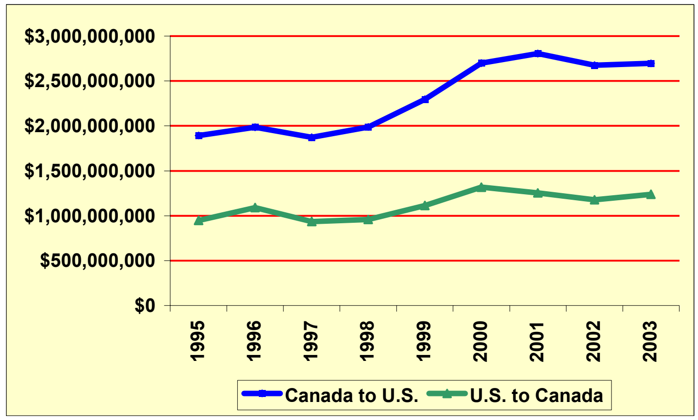
Introduction

Exhibit 1: Maine/New Hampshire Cross Border Trade



Regulations governing truck size and weight have impacts on highway safety, infrastructure preservation and economic efficiency. In the United States (U.S.), federal laws govern truck size and weight (TS&W) on the Interstate Highway System. Federal TS&W laws are of particular importance to U.S. border-states heavily impacted by the North American Free Trade Agreement. **Exhibit 1** shows exports from Maine and New Hampshire, which in 2003 exceeded $1 billion. Nearly all this trade travels by truck. Both Canada and Mexico allow significantly higher truck weight limits in their respective counties. As a result, U.S. companies competing against cross-border rivals in natural resource based industries, where profit margins are typically low find it difficult to compete against foreign competition that is able to use more efficient means of transportation.

Exhibit 2: Truck Weight Limits in Maine & NH

Axle Configuration	Maine		New Hampshire
	Special	All Other	
Single axle limit	24,200 lbs.	22,400 lbs.	22,400 lbs.
Tandem axle limit			36,000 lbs.
5 axle combination	44,000 lbs.	38,000 lbs.	
6 axle combination	44,000 lbs.	41,000 lbs.	
Tri-axle wt limit			48,000 lbs.
5 axle combination	54,000 lbs.	48,000 lbs.	
6 axle combination	54,000 lbs.	50,000 lbs.	
GVW limit %			
5 axle combination	88,000 lbs.	80,000 lbs.	84,000 lbs.
6 axle combination	100,000 lbs.	100,000 lbs.	99,000 lbs.

Transport for natural resource industries like agriculture, timber and ore are often characterized by heavy loads moving short distances. In 1998, 92 percent of all freight (by weight) originating in Maine was transported by truck and 75 percent of all originating truck flows moved 250 miles or less. In New Hampshire, 96 percent of all freight tonnage originating in the state moved by truck, with 76 percent of all originating truck flows moved 250 miles or less.

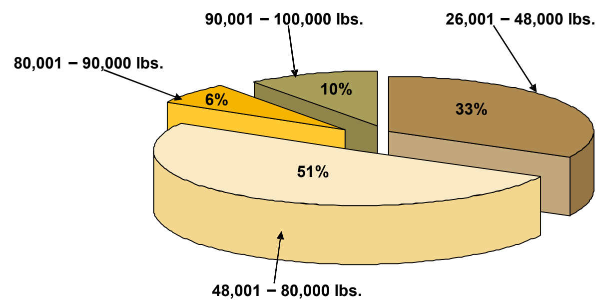
State truck weight limits **(Exhibit 2)** have been enforced on the Maine Turnpike since it was constructed in the late 1940's. The Maine Turnpike was designated part of the Interstate Highway System in 1956. The 15-mile New Hampshire Turnpike opened to traffic in 1950 and was designed part of I-95 in 1960. Maine and New Hampshire have traditionally enforced higher state weight limits on the portions of I-95 that are the Maine and New Hampshire Turnpikes.

**Special Conditions of operation for 6- axle combination trucks*:
1) Special commodity 6-axle combinations may register for 90,000 lbs. and are allowed a tolerance to 100,000 lbs.; all others must register for 100,000 lbs.
2) The distance between the extreme axles, excluding the steering axle, must be at least 32 feet if carrying "special commodities" and at least 36 feet for other commodities.
3) The distance between the steering axle and the first axle of the tandem must be at least 10 feet.

In 1994 The Federal Highway Administration (FHWA) threatened to withhold state funds for not enforcing federal Interstate weight limits on the turnpike portions of I-95. In response the State of Maine sought and obtained an exemption from Congress formalizing its long-standing practice of enforcing state weight limits on the Maine Turnpike. Congress provided the exemption in 1998 as an element of TEA-21. As a condition of granting the exemption from federal weight limits Congress stipulated that each state undertake a study; "*analyzing the economic, safety, and infrastructure impacts of the exemption.*" In 2002, the Maine Department of Transportation (MDOT), in conjunction with the Maine Turnpike Authority and the New Hampshire Turnpike Authority contracted with Wilbur Smith Associates to examine the impacts resulting from the federal weight exemption on the Maine Turnpike and New Hampshire Turnpike.

Maine Registered Vehicle Weight

In 2002 there were 138,709 registered commercial vehicles in Maine. More than half (57%) were registered for less than 26,000 lbs. Approximately 90% of all registrations were single unit vehicles. Of the vehicles registered to carry 26,000 lbs. or more only 3,262 (16%) were registered to carry over 80,000 lbs.. The registration statistics reinforce the assumption that the vehicles examined by this study represent only a fraction of the commercial vehicle population.



Source: Maine Bureau of Motor Vehicles

Data Sources

Numerous data sources were used to model how changes in weight policy would affect travel patterns of 5-axle and 6-axle tractor-semi-trailer (TST) trucks moving heavy commodities. Three principal data sources were used to understand existing truck traffic (exempt scenario) and estimate changes in truck flows if the current federal weight exemption ended (study scenario):

1. **Weigh-in-motion (WIM) sites**: Data from ten WIM stations in Maine and two in New Hampshire were used to develop estimates of *Equivalent Standard Axle Loads* (ESAL) and for network calibration. Records for every vehicle with 5 or more axles were extracted, resulting in the analysis of more than 10.5 million records.
2. **Vehicle classification counts**: Truck count data was taken from 842 vehicle classification stations maintained by MDOT, as well as from class counts in the NHDOT SmartMap system. Counts for 5 and 6-axle TST combination vehicles were used to establish truck volumes on the base network, and to calibrate the truck traffic model.
3. **TRANSEARCH commodity data**: A proprietary database providing county level freight flows by mode and commodity it is considered the premier source for intercity and intra-city commodity flows. TRANSEARCH provides volume and value by individual commodity and mode of transport throughout the U.S.

These data were supplemented with information from motor vehicle registrations, interviews with trucking firms and city officials, and with information from weight enforcement officials.

TRANSEARCH data for the State of Maine was purchased and a series of filters were applied to the data for the purpose of identifying commodities likely to be transported by vehicles in exempt weight ranges (80,000 – 100,000) lbs. The top commodities resulting from the filtering process are shown in the table of **Exhibit 3**. Several of these commodity groups were aggregated, and one – "Secondary Traffic" was dropped from the analysis. More than 95% of the Secondary Traffic moving in Maine is mixed commodities moving between warehouse facilities. Typically, mixed commodities "cube-out" (use available volume capacity) before "weighing-out" (use available payload). Four primary commodity groups became the focus of the heavy truck flow modeling:

- Wood & Paper;
- Petroleum;
- Concrete and Stone,
- Food, Farm & Fish Products

Flows were also examined at a detailed commodity level to identify *"special commodities"* that under Maine weight laws qualify for a 10% weight bonus. The listing in **Exhibit 4** shows the special commodities selected from the database descriptions:

Exhibit 3: Top Commodity Tons

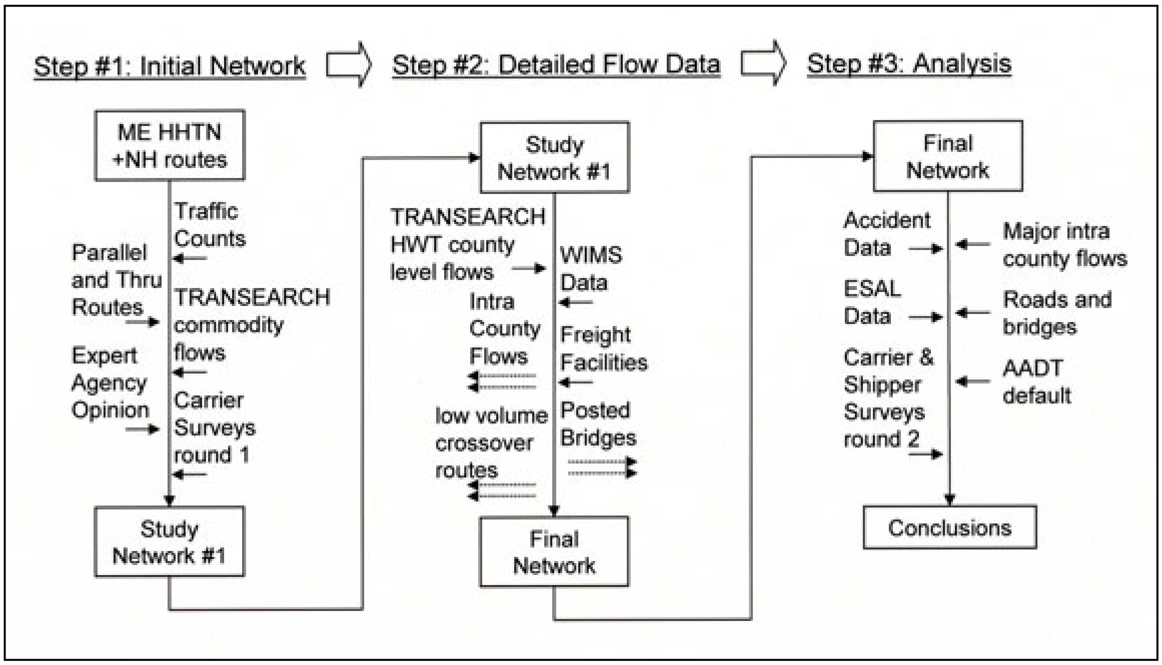
STCC2	Commodity Group	Tons
29	Petroleum or Coal Products	21,051,444
24	Lumber or Wood Products	18,044,677
32	Clay, Concrete, Glass or Stone	7,233,870
50	Secondary Traffic	6,768,652
20	Food or Kindred Products	4,147,817
26	Pulp, Paper or Allied Products	2,611,756
14	Nonmetallic Minerals	1,572,526
28	Chemicals or Allied Products	1,129,204
34	Fabricated Metal Products	868,926
1	Farm Products	724,813

Exhibit 4: "Special Commodities" Extracted from TRANSEARCH

- Concrete products
- Portland Cement
- Broken stone or riprap
- Gravel or sand
- Dimension Stone, Quarry
- Clay, Ceramic Minerals
- Fertilizer Minerals – Crude
- Misc. Non-metallic Minerals
- Clay, Brick or Tile
- Ceramic Floor or Wall Tile
- Meat, Fresh or Chilled
- Meat, Fresh Frozen
- Meat Products
- Dressed Poultry, Fresh
- Dressed Poultry, Frozen
- Processed Poultry or Eggs
- Creamery Butter
- Ice Cream or Frozen Desserts
- Cheese or Special Dairy Products
- Processed Milk
- Processed Fish
- Maine Products
- Fresh Fish or Whale Products
- Frozen Fruit, Vegetables or Juice
- Frozen Specialties
- Ice, Natural or Manufactured
- Forest Products
- Primary Forest Materials
- Lumber or Dimension Stock
- Misc. Sawmill
- Millwork
- Plywood or Veneer
- Structural Wood Products
- Treated Wood Products
- Misc. Wood Products
- Pulp or Pulp Mill Products
- Fiber, Paper or Pulp board
- Pressed or Molded Pulp Products
- Paper or Building Board
- Ashes
- Metal Scrap or Tailings
- Paper Waste or Scrap

Exhibit 5 presents a flow diagram of the iterative process used to create the truck traffic model applied to the *Study Network*.

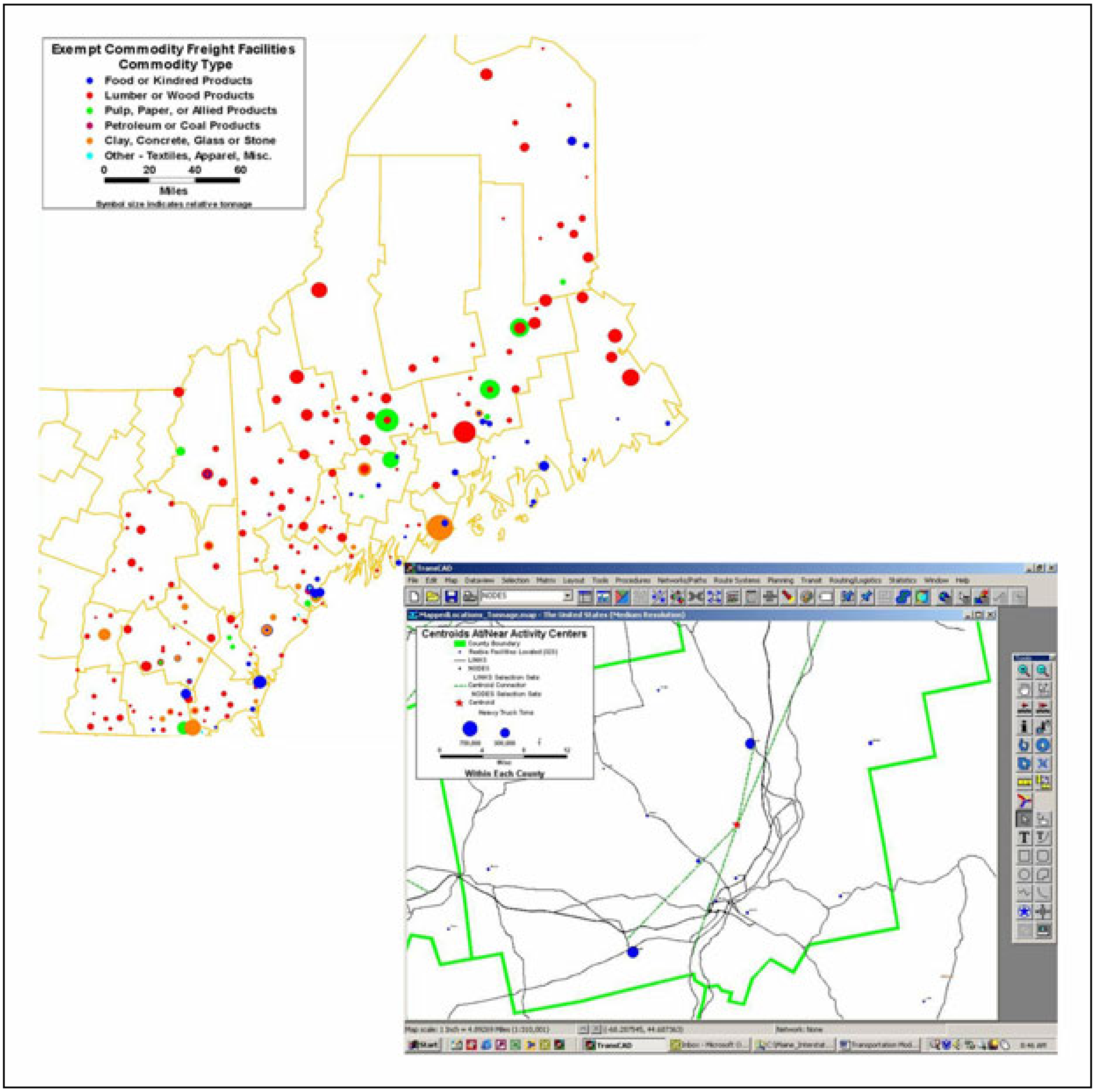
Exhibit 5: Study Network Development Process*



The commodity data purchased by MDOT included the locations of major industrial facilities in both Maine and New Hampshire. The *Freight Locator Database* was used to identify facilities potentially receiving or producing products in exempt commodity groups. **Exhibit 6** illustrates facilities handling exempt weight commodities with an influence on traffic using the Maine Turnpike and New Hampshire Turnpike. These facilities were added to the modeled traffic network as "centroids" for county level truck origins and destinations. A least travel time algorithm was applied to the data, and all truck flows were assigned to the Maine and New Hampshire Turnpikes and parallel routes were "turned-off." As a result, for any O/D pair requiring a north/south routing through eastern New Hampshire and southern Maine, the Maine Turnpike and New Hampshire Turnpike were treated as the only available routes.

* Diagram Abbreviations: HHTN = Heavy Haul Truck Network, AADT = Average Annual Daily Traffic

Exhibit 6: Heavy Commodity Freight Facilities



Truck counts were estimated from the commodity data using theoretical payload figures for 5 and 6 axle tractor semi-trailer (TST) combination trucks†. The derived truck counts were later distributed across the study network and are shown in **Exhibits 7 and 8.**

Exhibit 7: Truck Count Estimates – Maine Turnpike

Commodity Group	Total Truck Tons	Theoretical 5-Axle Count	Theoretical 6-Axle Count
Petroleum & Coal	9,972,347	349,907	293,304
Lumber, Wood & Paper	3,251,083	114,073	95,620
Food & Fish Products	1,199,238	42,079	35,272
Stone & Concrete	685,156	24,041	20,152
Total	**15,107,824**	**530,099**	**444,348**

If the exemption from federal weight limits rescinded on the ME/NH Turnpike System it is expected that there would be an *increase* in 5 and 6 axle combination trucks, hauling loads between 80,000 and 100,000 lbs. GVW (exempt weights), on alternate state highway routes. This assumption suggests that ending the current exemption would result in a *net increase* of traffic on other routes. These other routes will be primarily State roads.

Exhibit 8: Truck Count Est. – New Hampshire Turnpike

Commodity Group	Total Truck Tons	Theoretical 5-Axle Count	Theoretical 6-Axle Count
Petroleum & Coal	61,361	2,153	1,805
Stone & Concrete	140,815	4,941	4,142
Lumber, Wood & Paper	117,512	4,123	3,456
Total	**319,688**	**11,217**	**9,403**

The table in **Exhibit 9** shows the summary mileage of the non-Turnpike road types (diversion routes) in the *Study Network*. As a reality check on the modeling process, a series of phone interviews were conducted with trucking companies to learn about their routing decisions.

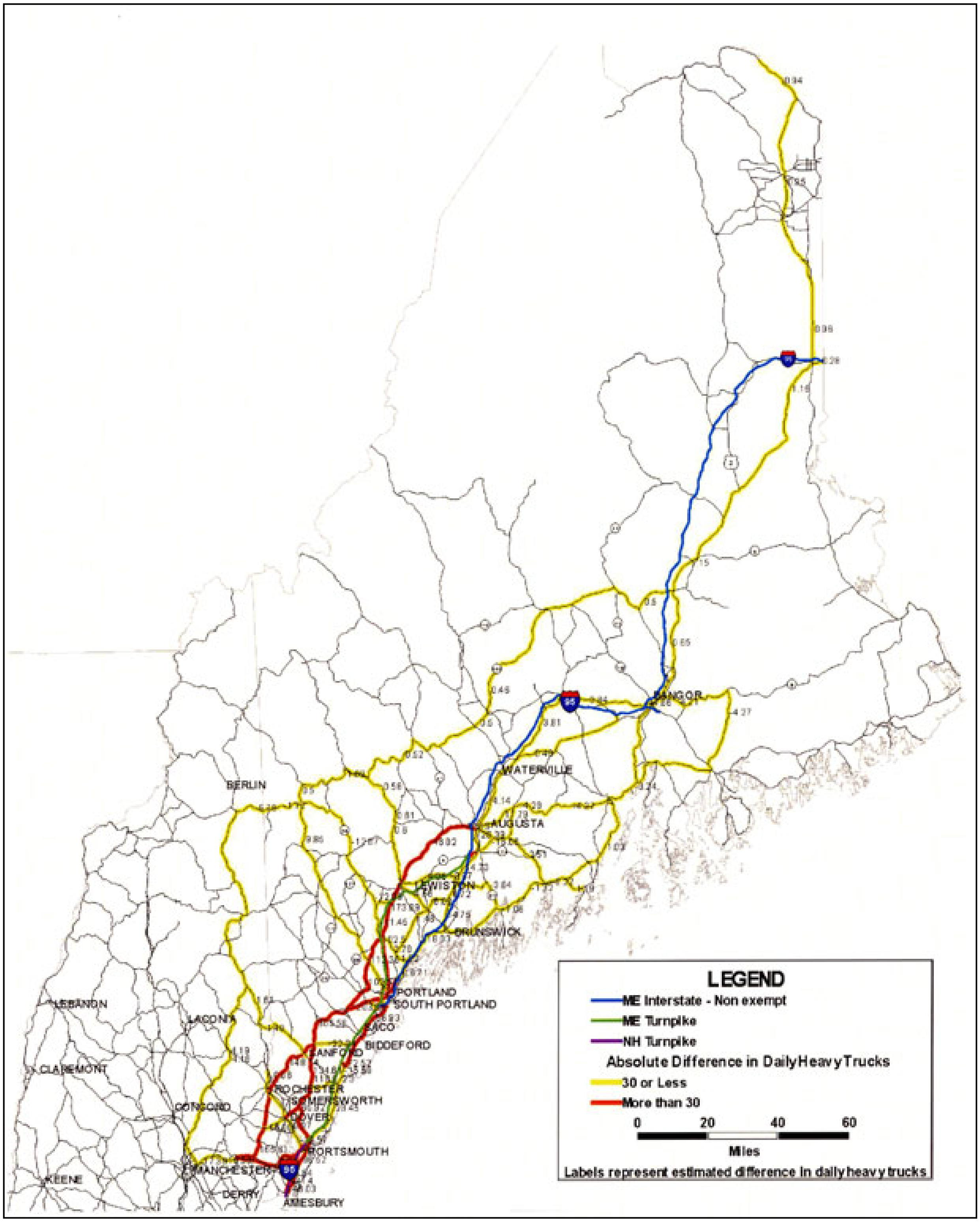
Exhibit 9: Study Network Miles by Functional Class

Functional Class	State		Total Miles
	ME	NH	
Local and Other	9.0	7.5	16.5
Major Urban Collector	270.0	6.7	276.7
Minor Arterial	449.2	45.9	495.1
Principal Arterial	437.5	225.0	662.5
Grand Total	**1,165.7**	**285.1**	**1,450.8**

Exhibit 10 on the following page shows *study network,* including the diversion routes that were derived from modeling commodity trips when the Turnpike facilities are not an available route. The model and associated road network were used to analyze the safety and infrastructure impacts that would result from ending the current exemption to the federal GVW limits on the Maine Turnpike and New Hampshire Turnpike.

† A weighing sample of empty 6-axle TST vehicles by the Maine State Patrol found a wide range of tare weights. The theoretical tare weight used here is based on figures used in the USDOT Comprehensive Size and Weight Study, and phone calls to semi-trailer manufacturers. The tare weights used also fell within the average empty vehicle weights for 5 and 6-axle trucks detected at Maine WIM stations.

Exhibit 10: Final Study Network: Maine Turnpike, New Hampshire Turnpike and Study "Diversion Routes"



Safety Analysis

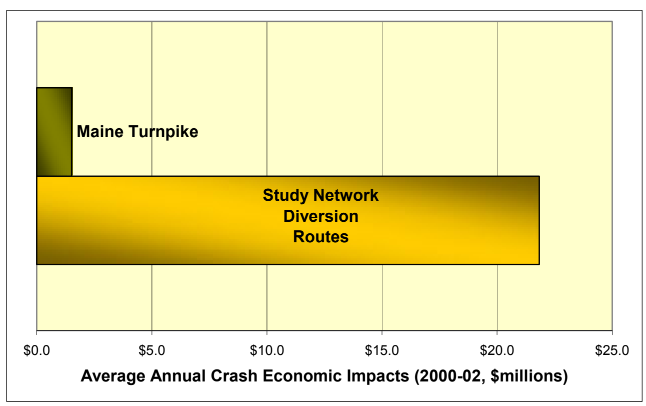
“Geo-coded” crash data was available from the MDOT that could be used to analyze TST combination truck crashes by functional highway class in Maine. A previous study of truck size and weight noted a strong correlation between crash rates and functional highway class:

> *“Numerous analyses of crash data bases have noted that truck travel, as well as all vehicle travel, on lower standard roads (that is, undivided, higher speed limit roads with many intersections and entrances) significantly increases crash risks compared to travel on Interstate and other high quality roadways. The majority of fatal crashes involving trucks occur on highways with lower standards…. The [fatal crash] involvement rate on rural Interstate highways is 300 percent to 400 percent lower than it is on other rural roadway types and is generally the same for all vehicle types.”*[‡]

The geo-coded crash analysis divided 14,244 road segments in the Maine portion of the study network into 3 groups of roadways (*each network segment was in one, and only one group*):

- *Non-Exempt Interstates*, controlled-access facilities expected to gain traffic in the scenario under study (i.e. exempt weights allowed on the interstate). 546 centerline miles (of two or more lanes, running in the same traffic direction).
- *Maine Turnpike,* controlled-access facilities expected to lose traffic in the study scenario - 242 centerline miles; and,
- *Diversion Routes,* which constitute the rest of the *study network*, and which are expected to lose traffic, under an Interstate exempt scenario - 4,538 centerline miles (primarily of two lanes, each running in opposite traffic directions).

Exhibit 11: Annual Network TST Crashes



Three years (2000 – 2002) of geo-coded crash data were filtered by recorded vehicle type to extract only crashes involving 5 or 6 axle TST vehicles, with GVW registrations of 80,000 lbs. or more, occurring on some portion of the *study network.* A total of 1,000 crashes from the three years of data passed both filters to constitute the crash sample.

Exhibit 11 shows the annualized number of 5 and 6 axle TST crashes on the Maine Turnpike, non-exempt Interstate, and *study network* “diversion” routes.

A process was applied that linked the estimated TST average annual daily traffic (AADT) by road segment in the study network to TST crashes on those segments. The process allowed the study team to estimate “crash rates” expressed as TST crashes per “100 million vehicle miles traveled” (HMVMT) by type of highway facility in the study network.

[‡] *Comprehensive Truck Size and Weight Study: Vol. III Scenario Analysis*, USDOT, Aug 2000. pp. VIII-3.

Exhibit 12 shows the crash rates for 5 and 6-axle TST vehicles registered to carry 80,000 lbs. or more. On the Maine Turnpike the computed rate is 27 crashes/ HMVMT (the comparable rate for non-exempt Maine Interstate Highways 42 crashes/ HMVMT). The crash rate on all other study network routes the rate is 115 crashes/ HMVMT.§

Exhibit 12: TST Crash Rates – Study Network

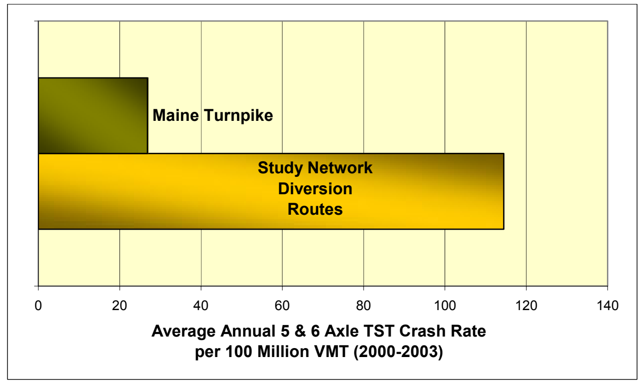
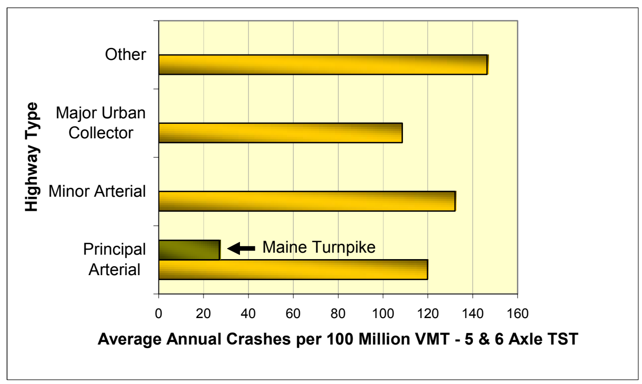


Exhibit 13 shows the crash rates derived for 5 and 6-axle TST vehicles the study network using federal definitions for highway functional class.

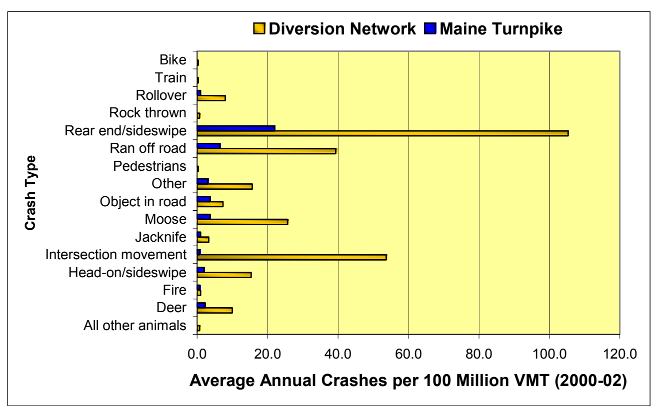
Exhibit 13: TST Crash Rate by Highway Class



The crash rate for 5 and 6-axle TST trucks of 27 crashes/HMVMT on the Maine Turnpike is of particular note, as it currently allows vehicles over 80,000 lbs. Non-Interstate highway types in the study network, including other principal arterials are at least 4 times higher than the crash rate on the Turnpike, and more than double the rate for the non-exempt Interstate System.

Exhibit 14 compares crash rates on the Maine Turnpike and diversion routes for 5 and 6-axle TST trucks by type of crash.

Exhibit 14: Study Network Crash Rates by Type



Crash rates on diversion highways are higher for all crash types, but *intersection movement*, *head-on side-swipe*, and *read-end side-swipe* are dramatically more prominent. This finding is not surprising as most roadways in the diversion network are two lane highways with at-grade intersections, while the Turnpike is a controlled access, divided highway with four or more lanes. The crash rate on the Maine Turnpike for "*rear-end side-swipe"* was 13 crashes/HMVMT compared with 42 crashes/HMVMT on diversion routes.

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§Crash counts and rates are based upon "vehicle involvement" where each truck was counted as one "involvement." A collision involving two trucks thus yields two vehicle involvements.

Exhibit 15: Study Network Crash Rate by Severity

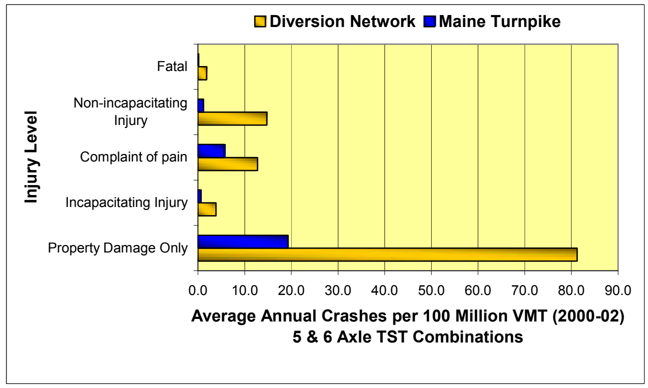
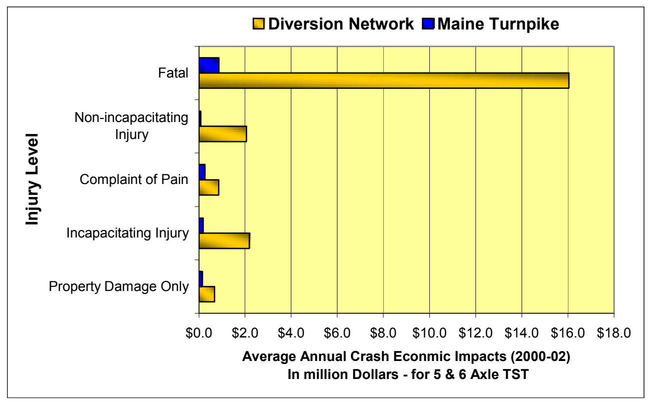


Exhibit 15 displays crash rates for the Maine Turnpike and other functional highway classes in the diversion network by severity of the crash. The fatal crash rate of .2 crashes/HMVMT for both the Maine Turnpike and non-exempt portions of the Maine Interstate is not visible on the graphic. The fatal crash rate of 1.9 crashes/ HMVMT on diversion routes is nearly 10 times the rate on Interstate facilities. Incapacitating injury crashes are nearly 7 times more prevalent on diversion roadways than on the Maine Turnpike.

Exhibit 16: Annual Economic Impact by Crash Severity



The geo-code dataset supplied by MDOT also contained FHWA defined "economic impacts" associated with vehicle crashes**. **Exhibit 16** shows the economic impacts associated with crashes by injury severity. The results are displayed for the Maine Turnpike and diversion routes. Fatal crashes involving 5 and 6-axle TST trucks on non-Turnpike facilities in the study network are estimated to carry an associated annual economic impact of $16 million per year. The associated impact of all crash types on diversion routes is estimated to be $21.8 million. The associated economic impact of TST fatal crashes on the Maine Turnpike is $900,000. The economic impact for all crash types on the Maine Turnpike is $1.5 million.

The safety analysis indicates that if Congress were to remove the current weight exemption on the Maine Turnpike the net impact for Maine would be an increase of 5.0 crashes annually with associated FHWA defined economic impacts of $443,000 per year.

For the New Hampshire safety analysis, the crash rates by functional highway class developed from the crash experience in Maine were applied to the expected change in New Hampshire TST truck traffic by functional class on the modeled study network. **The analysis indicated that removing the federal weight exemption on the New Hampshire Turnpike would result in a net increase of 1.2 crashes per year in New Hampshire with an associated economic impact of $98,000 per year.**

**USDOT, FHWA Technical Advisory T7570.2 Motor Vehicle Accident Costs, October 31, 1994.

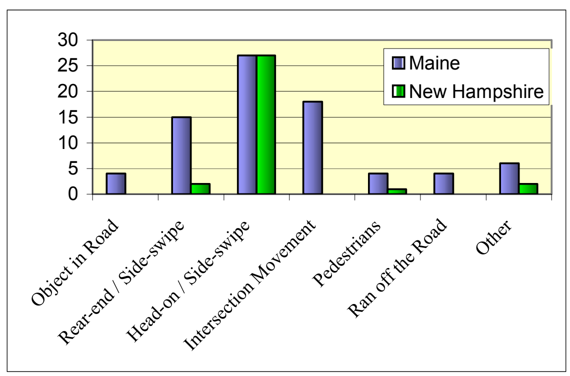
Comparative Analysis of Truck Crashes by State

In addition to the geo-coded analysis of TST truck crashes in Maine, the study team examined fatal truck crashes across all states to gain an understanding of the relative safety environment for commercial vehicles in Maine and New Hampshire as compared to other jurisdictions. Between 1996 and 2000, Maine averaged 11 fatal truck crashes per year, while New Hampshire averaged 9 fatal truck crashes per year.

A regression analysis was performed to examine the correlations between TST fatal crashes, cargo volumes, and VMT. For all states, a 5 year average of fatal TST crashes was regressed against year 2000 VMT and year 1997 truck freight ton-miles. Overall, the results showed a strong, positive relationship between TST-VMT and the number of fatal crashes, indicating that fatal TST crashes are expected to increase as TST-VMT increases. The regression also indicated a strong negative relationship between the ratio of truck freight ton-miles to all truck VMT, and the number of fatal TST crashes. The results suggest that fatal TST crashes are expected to decrease as the 'average payload' increases. This finding supported previous studies suggesting that higher payloads will likely reduce crashes by reducing truck traffic.

Maine exhibited fatal TST crash rates below the average by both VMT and ton-mile measures. A strong explanatory factor is that Maine's ratio of ton-mile/truck VMT (6.039) is higher (106.61%) than the national average – in other words, Maine has higher average truck payloads and thus, based on the correlations found in the data, is expected to have a lower than average TST crash rate. New Hampshire exhibited a TST fatal crash rate above the average for by both VMT and ton-mile measures. A strong explanatory factor is New Hampshire's lower than average payloads.

Exhibit 17: Fatal Crashes by Type (1999-2001)



The States of Maine and New Hampshire also provided three years worth of fatal truck crash data (1999-2001) that was analyzed in detail. A review was made of fatal crash records to determine those crashes were the truck driver was found to be at fault. In "truck driver-at-fault crashes, the most prominent contributing factor in Maine was driver inattention or distraction (6 fatal crashes), followed by illegal or unsafe speed (2 fatal crashes). New Hampshire records indicated only two crashes where the commercial vehicle driver was determined to be "at fault." **Exhibit 17** shows an example from the data examined, showing fatal truck crashes by type of crash involvement.

The comparative state analysis found no correlation between states that allow normal GVWs in excess of 80,000 pounds on state networks and high crash rates; in fact, the regression analysis found a positive correlation between low crash rates and high load factors. The detailed fatal crash analysis for Maine and New Hampshire found no evidence to suggest that heavy TST crashes are over-represented or more at fault than other types of commercial vehicles.

Pavement Analysis

Currently Maine and New Hampshire together spend nearly $75 million each year on pavement rehabilitation and preservation. From an operations and maintenance standpoint, vehicle axle loads and environment are the primarily determinants of pavement wear. Changes to vehicle size and weight policy can substantially impact the costs for pavement maintenance and rehabilitation. The objective of the pavement analysis conducted for this study is to relate the impact from changes in axle loadings under the study scenario to reflect pavement damage in terms of potential state expenditures. The approach taken in this study uses pavement consumption factors referred to as Equivalent Single Axle Loads (ESAL) to estimate changes in pavement wear. (Note: ESAL refers to the pavement consumption from a single truck axle carrying 18,000 lbs.).

Using the data sources previously discussed the study team calculated the incremental differences in truck volumes and associated ESAL loadings on the study network that were observed by model runs of both the base and study scenarios. As expected, if the federal weight exemption in force on the Maine and New Hampshire Turnpikes ended, 5 and 6 axle TST traffic on non-interstate highways types would increase, while traffic on the Turnpikes would decrease. These changes are summarized by functional highway class in the tables of **Exhibits 18 and 19.**

Exhibit 18: Summary Impacts to Maine Pavements for the Study Scenario††

Functional Highway Class	Change in Daily Truck-Miles - Five Axle	Change in Daily Truck-Miles - Six Axle	Total Change in Daily Truck-Miles	Change in Daily ESAL Miles - Five Axle	Change in Daily ESAL Miles - Six Axle	Total Change in Daily ESAL Miles
Major/urban collector	747	1,382	2,129	2,891	5,775	8,666
Minor arterial	3,163	7,034	10,196	12,241	29,403	41,644
Principal arterial - Other	2,398	6,456	8,854	9,284	26,989	36,273
Principal Arterial - Interstate	-5,258	-15,578	-20,836	-20,349	-65,115	-85,465

Exhibit 19: Summary Impacts to New Hampshire Pavements for the Study Scenario

Functional Highway Class	Change in Daily Truck-Miles - Five Axle	Change in Daily Truck-Miles - Six Axle	Total Change in Daily Truck-Miles	Change in Daily ESAL Miles - Five Axle	Change in Daily ESAL Miles - Six Axle	Total Change in Daily ESAL Miles
Major/urban collector	6	4	10	23	18	41
Minor arterial	537	65	603	2,077	273	2,350
Principal arterial - Other	2,238	1,578	3,816	8,663	6,597	15,260
Principal Arterial - Interstate	-730	-1,148	-1,877	-2,824	-4,797	-7,621

†† The study scenario assumes the federal weight exemption on the ME/NH Turnpikes is discontinued. For this analysis "Other Freeways and Expressways was grouped with Other Principal Arterials.

MDOT and NHDOT also provided cost details about their pavement resurfacing program, representing the *entire* mileage for each functional system. MDOT also provided historical data about its pavement program which were used in calculating high and low expenditures by functional class in both states. System-wide programmed pavement maintenance was used to develop *cost per ESAL-mile* normalized for each functional system element, which were then applied to the study network. The historical budget data received from Maine also show that allocations vary from one budget cycle to another, so the high and low budgets for each functional class were used to develop a range of estimated cost impacts. It was assumed that historically pavement budgets would be programmed to system elements based on their need and that historically maintenance need would be linked to the number of ESALs traveling over those systems. The cost per ESAL-mile factor was applied to incremental ESAL loadings (positive or negative) to determine cost impacts for the study scenario. The pavement resurfacing cost impacts are summarized in **Exhibits 20 and 21:**

Exhibit 20: MDOT Resurfacing Cost Impacts from ending the Turnpike Exemption

Functional Highway Class	Change in Daily ESAL Miles	98-'05 Resurfacing Cost/Daily ESAL Mi. (Low)	98-'05 Resurfacing Cost/Daily ESAL Mi. (High)	Change in MDOT Resurfacing Program (Low)	Change in MDOT Resurfacing Program (High)
Major/urban collector	8,666	$11.76	$25.58	$101,864.68	$221,650.00
Minor arterial	41,644	$23.89	$47.84	$994,791.19	$1,992,134.31
Other principal arterial	36,273	$19.29	$27.06	$699,700.99	$981,823.77
Turnpike	-85,465	$5.97	$9.58	($510,065.00)	($818,836.30)
				$1,286,291.86	$2,376,771.78

Exhibit 21: NHDOT Resurfacing Cost Impacts from Ending the Turnpike Exemption

Functional Highway Class	Total Change in Daily ESAL Miles	98-'05 Resurfacing Expenditure/Daily ESAL Mi. (Low)	98-'05 Resurfacing Expenditure/Daily ESAL Mi. (High)	Change in NHDOT Resurfacing Program (Low)	Change in NHDOT Resurfacing Program (High)
Major/urban collector	41	$0.27	$0.33	$11.19	$13.68
Minor arterial	2,350	$7.50	$9.17	$17,632.71	$21,551.10
Other principal arterial	15,260	$4.77	$5.83	$72,818.86	$89,000.83
Turnpike	-7,621	$6.38	$8.05	($48,615.88)	($61,372.01)
				$41,846.89	$49,193.59

The pavement analysis estimated that if the current Turnpike Exemption were to end, the State of Maine would experience higher pavement rehabilitation costs each year of between $1.29 million and $2.38 million. For the State of New Hampshire pavement rehabilitation costs would increase between $41,847 and $49,194.

Bridge Analysis

Bridges represent critical links and potential bottlenecks in highway transport systems for freight. The impacts of truck size and weight on bridge stress and fatigue remains one of the more controversial issues associated with truck regulatory policy, due to the complexity in analyzing a wide variety of structures and the high costs associated with bridge replacement. The current federal bridge formula (FBF) also represents the limiting factor in current gross weight policy on the Federal Interstate Highway System.

Bridge Impacts Analysis Methodology: Three loading cases were considered:

- Case 1: 80,000 lb. Truck, Base Loading
- Case 2: 88,000 Lb. Truck, 5-Axle Loading
- Case 3: 100,000 Lb. Truck, 6 Axle Loading

Cost impacts associated with a GVW policy change were analyzed from two perspectives:

1. The increase/decrease in normal wear and tear and its associated maintenance cost.

2. Long term effects of the loading with regards to fatigue of the bridge superstructure.

Two groups of bridges were analyzed in conducting the analysis, Turnpike/Interstate bridges and non-interstate bridges. For each group of bridges, the study developed truck volumes by vehicle type, which apply for the three loading cases. Cost estimates were developed (in 2003 dollars) for two cost categories: 1) Periodic Maintenance, and; 2) Major Rehabilitation.

An inventory of 147 bridges in New Hampshire and 88 bridges in Maine were analyzed based on the implementation of the study scenario. As with the other analyses, the study scenario assumes the Turnpike weight exemption would end, sending trucks over 80,000 on to state highway networks. The bridges analyzed were defined by construction material, structural type and relative span length. The maintenance cost analysis was conducted for all structures with bridge decks. The longer term effects of exempt weight vehicles were studied by investigating the change in bridge fatigue life.

Periodic Bridge Maintenance Costs: Maintenance costs were calculated based on a five year maintenance period. The maintenance costs were weighted for several ranges of truck volume change. A change of 5 or fewer trucks per day due to a change in policy was assumed to have little or no effect on maintenance of a structure. For volume changes greater than 75 trucks per day, the full cost factor of 1 (-1) was used. The cost factor was reduced for volume changes between 5 and 75 in one third increments, i.e.; 5 to 35 trucks per day yielded a cost factor of 0.33 (-0.33) and 35 to 75 trucks per day yielded a cost factor of 0.67 (-0.67).

Results for New Hampshire are dominated by a large bridge (470,569 square feet of deck surface) on the Turnpike. The estimated maintenance on this single structure due to the exemption is more than $705,000. When annualized, ending the current federal weight exemption on the New Hampshire Turnpike <u>decreases</u> overall state bridge maintenance expenditures by $581,516. In Maine, ending the current federal weight exemption on the Maine Turnpike <u>increases</u> statewide annual bridge maintenance expenditures by $519,755.

Major Bridge Rehabilitation Costs: The cost for major rehabilitation was based on the total square feet of the bridges analyzed. Treatments considered under the major rehabilitation costs included deck replacement; deck joint and drainage system replacement, approach slab replacement, repainting, structural repair of corrosion and safety improvements. The rehabilitation portion of the analysis assumed that increasing truck weights would result in the need for a major rehabilitation project being performed on structures over 200 feet in total length.

Five structures in New Hampshire were candidates for rehabilitation:

Route #	Town	Bridge ID	Rehabilitation Cost
	North Hampton	081/093	$504,040
S16	Dover	132/102	$324,936
S16	Conway	170/071	$461,830
U1	Portsmouth	247/084	$3,482,818
S16	Bartlett	202/172	$358,630
25-Year Rehabilitation Cost Total			**$5,132,254**

Three structures in Maine fell into this category:

Route #	Town	Bridge ID	Rehabilitation Cost
Congress St.	Portland	0343	$860,000
Main St. / 202	Auburn	3076	$3,147,660
100;201;202	Augusta	5196	$3,115,530
25-Year Rehabilitation Cost Total			**$7,123,190**

The bridge analysis found that removing the federal weight exemption on New Hampshire Turnpike would result in overall annual bridge maintenance and rehabilitation savings of $376,226 per year in New Hampshire. Ending the current exemption on the Maine Turnpike would result in overall bridge maintenance and rehabilitation cost increases to the state of Maine by $804,683 per year.

Other Economic and Social Impacts

Toll Revenue Impacts

Currently 5 and 6 axle TST vehicles using the New Hampshire and Maine Turnpikes pay tolls as they pass through plazas located on the Turnpikes. If the current weight exemption were rescinded it is expected that these vehicles would divert to state highways allowing higher weights. The table below reflects the anticipated fiscal impacts based on the modeled changes in 5 and 6 TST traffic. The change in volume at each toll plaza has been multiplied by the minimum mainline cash rate for each vehicle type.[‡‡] The results in **Exhibit 22** on the following page suggest that potential revenue loss from the Maine Turnpike is nearly $650,000 annually. Revenue losses for the New Hampshire Turnpike are approximately $95,000.

[‡‡] Note: Tolls rates vary by direction, distance traveled, and whether the vehicle is on the mainline facility or exiting/entering via a ramp. Discounted rates are also offered for participating in electronic toll collection programs.

Exhibit 22: Annual Toll Impacts from Ending the Federal Weight Exemption

Impacts to Shippers and Carriers of Heavy Commodities

Toll Plaza	State	5-Axle Toll Rate (Cash)	Annual Change in 5-axle TST Traffic	Annual Revenue Loss - 5 Axle TST	6-Axle Toll Rate (Cash)	Annual Change in 6-axle TST Traffic	Annual Revenue Loss - 6 Axle TST	Combined 5 & 6 axle TST Annual Toll Revenue Loss
York	ME	$2.20	-20,540	-$45,188	$2.20	-47,060	-$103,532	-$148,720
Wells	ME	$0.75	-20,540	-$15,405	$0.75	-47,060	-$35,295	-$50,700
Kennebunk	ME	$0.75	-20,540	-$15,405	$0.75	-54,340	-$40,755	-$56,160
Biddeford	ME	$0.75	-22,620	-$16,965	$0.75	-62,140	-$46,605	-$63,570
Saco	ME	$0.75	-24,440	-$18,330	$0.75	-65,780	-$49,335	-$67,665
Scarborough	ME	$0.75	-24,700	-$18,525	$0.75	-65,780	-$49,335	-$67,860
I-295	ME	$0.75	-24,700	-$18,525	$0.75	-65,780	-$49,335	-$67,860
So. Portland	ME	$0.75	-7,280	-$5,460	$0.75	-26,000	-$19,500	-$24,960
Congress/ Jetport	ME	$0.75	-7,280	-$5,460	$0.75	-26,000	-$19,500	-$24,960
Westbrook	ME	$0.75	-13,780	-$10,335	$0.75	-46,540	-$34,905	-$45,240
Falmouth	ME	$1.50	-5,720	-$8,580	$1.50	-14,820	-$22,230	-$30,810
Total for Maine Turnpike				**-$178,178**			**-$470,327**	**-$648,505**
Hampton	NH	$3.50	-12,740	-$44,590	$4.00	-12,740	-$50,960	-$95,550
Total Annual Loss in Toll Revenues				**-$222,768**			**-$521,287**	**-$744,055**

The consultant team also interviewed 15 companies in Maine, and 9 companies in New Hampshire that ship or haul heavy commodities, primarily timber, bulk liquids, stone and aggregates, garbage and heavy equipment. Phone interviews with these companies were conducted over two different periods during the course of the study. In addition to gaining information about preferred routes if the Turnpike systems were unable to carry heavy loads, the survey questionnaire also asked companies how losing the current weight exemption would affect their businesses.

Nearly all respondents (88%) indicated that the current weight limit exemption was either “essential” or “very important” to their businesses. Respondents believed that the Turnpikes are the safest roadways; these highways are away from population concentrations, the roads are multi-lane, well maintained, and enable overall less time on the roadway for the transportation of heavy or dangerous commodities. One survey respondent stated:

“Safety is our biggest concern. The interstate, including the Maine and New Hampshire Turnpikes are the safest roads for heavy vehicle operations and petroleum transport.”

Companies generally responded that the exemption on the Maine and New Hampshire Turnpikes save time and money, observing that Interstate Highways are “built better.” If heavy loads were not allowed on the Maine and New Hampshire Turnpikes, respondents said those loads would be routed on the adjacent state routes. The general comment was that everyone wins; Interstates better able to handle heavy loads and easier to maintain. Respondents believed that weight enforcement is easier as well, noting that weigh-in-motion stations can be used more effectively on exempt Interstate routes because they would be the routing of choice for all heavy haulers.

Impacts to Communities[§§]

US Route 1: Searsport Village Center[+++]

Thirteen city officials from seven towns in Maine were also contacted for their opinions about the federal weight policy on the Interstate Highway System in Maine. Three of these communities, Falmouth, Yarmouth and Freeport are located near or adjacent to the Maine Turnpike. The city managers and police chiefs from these three towns were among the officials contacted. Overall, impacts from large trucks in these communities are significant. The police chiefs indicated that bringing large trucks through downtowns created unnecessary safety hazards, especially if these trucks were transporting hazardous materials. Alternate routes like U.S. 1 are heavily used by tourists and often bring traffic through historic city centers. One town manager said that since the exemption on the Turnpike, the city now experienced fewer complaints about truck traffic and noise.

Maine Turnpike[+++]

Study Conclusions

The analysis assumes that removal of the current federal truck weight exemption on the Maine and New Hampshire Turnpikes would divert five and six axle TST combinations over 80,000 pounds from the Turnpikes to non-Turnpike state highways. **Exhibit 23** summarizes the economic impacts that would result from removing the current federal weight exemption from the Maine and New Hampshire Turnpikes.

Exhibit 23: Annual Economic Impacts Associated with Removing the Current Federal Truck Weight Exemption on the Maine and New Hampshire Turnpikes

	Maine	New Hampshire	Total
Safety	$443,000	98000.00	$541,000
Pavement (Low)	$1,286,292	41847.00	$1,328,139
Pavement (High)	$2,376,772	49194.00	$2,425,966
Bridge	$804,483	-376226.00	$428,257
Tolls	$648,505	95550.00	$744,055
Total (Low)	**$3,182,280**	**-140829.00**	**$3,041,451**
Total (High)	**$4,272,760**	**-133482.00**	**$4,139,278**

The economic impact in Maine and New Hampshire that would result from removing the federal truck weight exemption on the Maine and New Hampshire Turnpikes is estimated to be between $3.0 million and $4.1 million annually.

[§§] Photos courtesy of PACTS

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